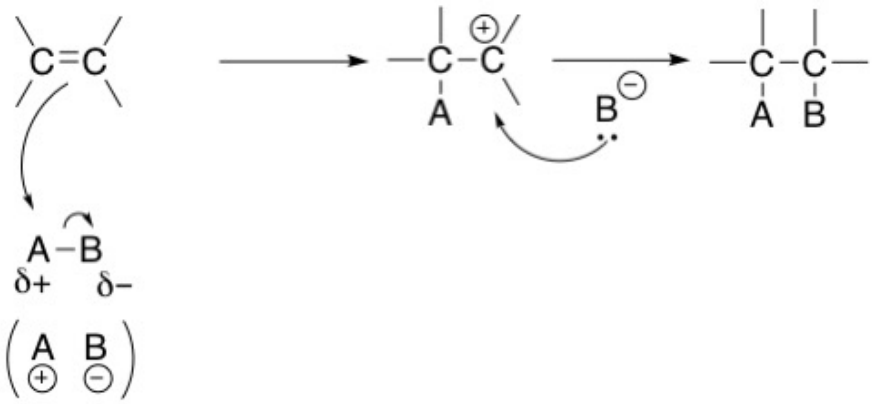
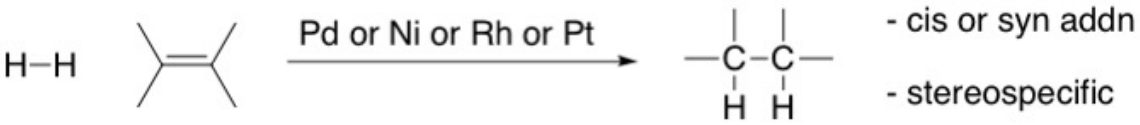
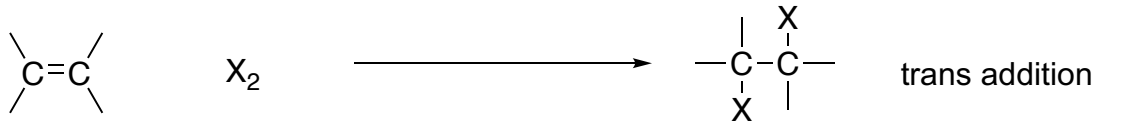
RECALL (REVIEW)

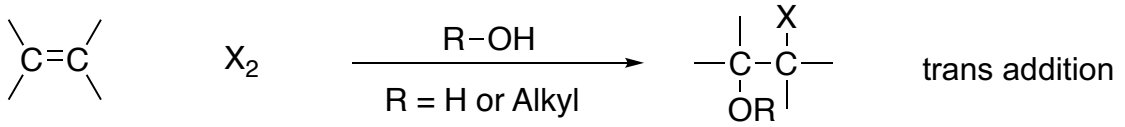
Addition Reactions:

General Mechanism

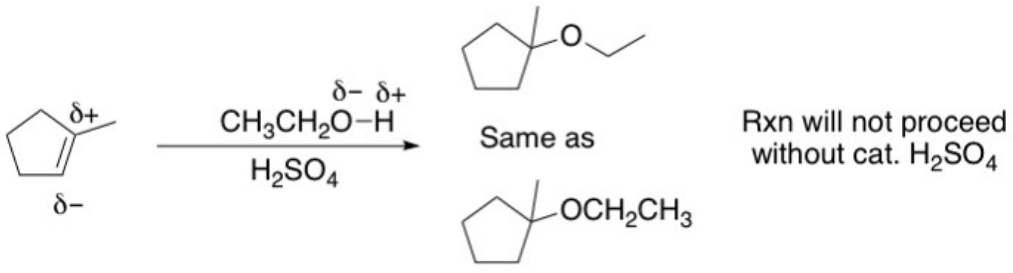




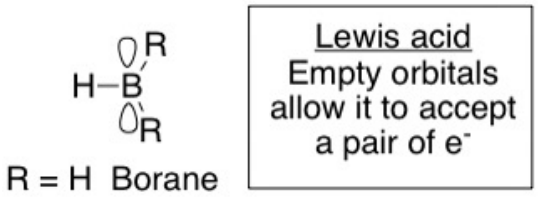




Water or Alcohol Addition



<u>Hydroboration -</u> Addition of Boron with Hydride (H: minus)

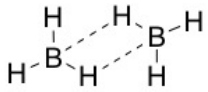


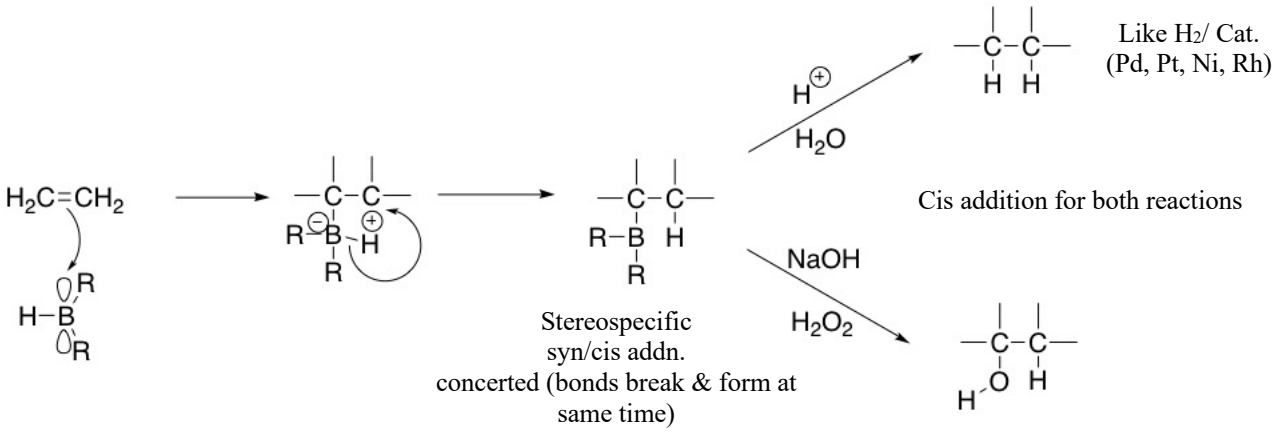
Structure of borane

Exists as Diborane (B_2H_6), but behaves like BH_3

Borane BH_3

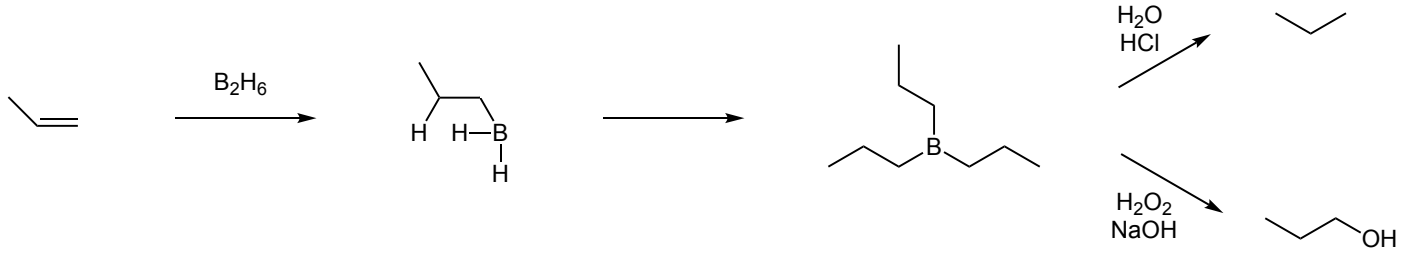
Diborane



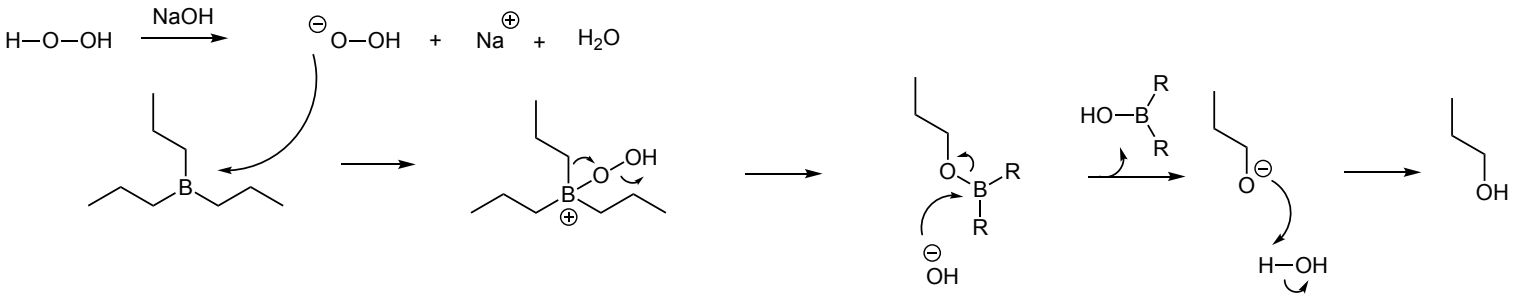


organoborane

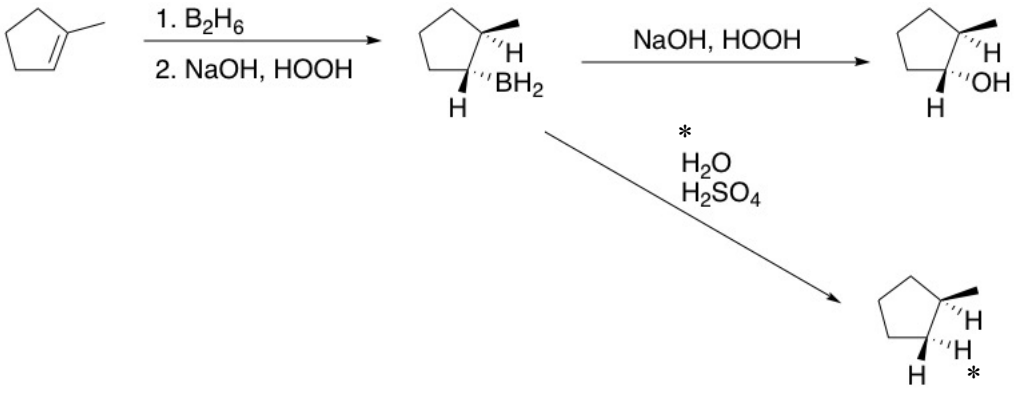
Example



Mechanism of addition of OH



Example

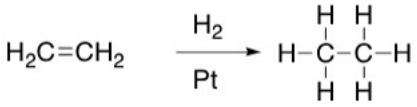


Syn addition, but anti-Markovnikov addn of HOH overall

Oxidation and reduction reactions

Reduction adds electrons
Oxidation removes electrons

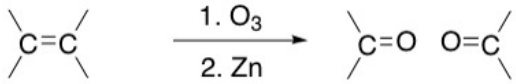
Reduction Reaction



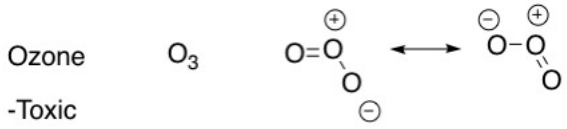
12 e^- outer shell 14 e^- outer shell

As there is an increase in the electron count in the outer shell, this is a reduction of ethylene.

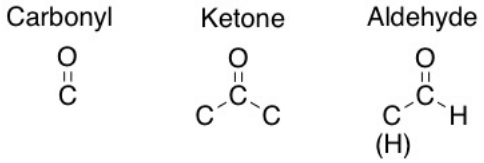
Ozonolysis - an Oxidation of Alkenes



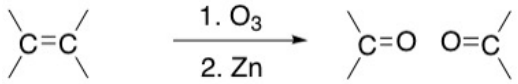
Ozonolysis (lysis = cleavage)



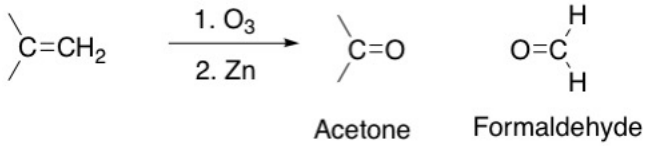
Examples of carbonyl groups (part of many functional groups)



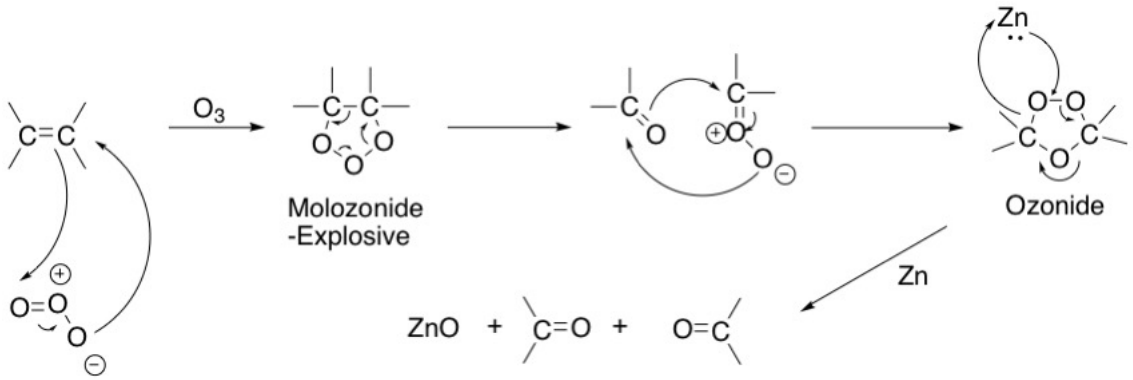
Reaction scheme of ozone



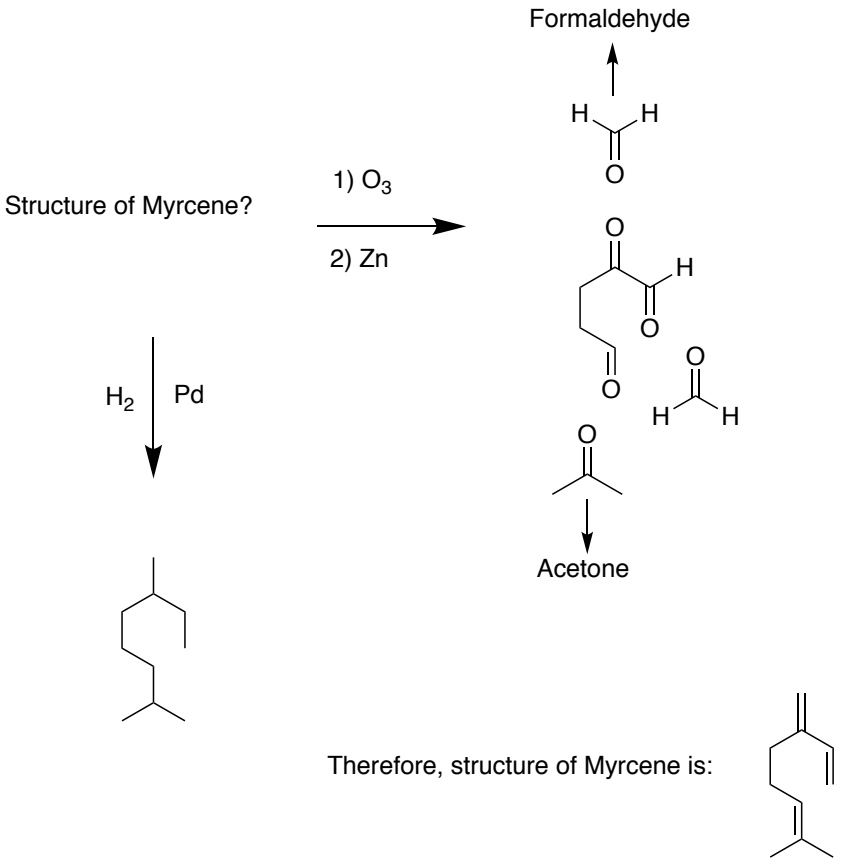
Example



Ozonolysis Mechanism (lysis = cleavage)



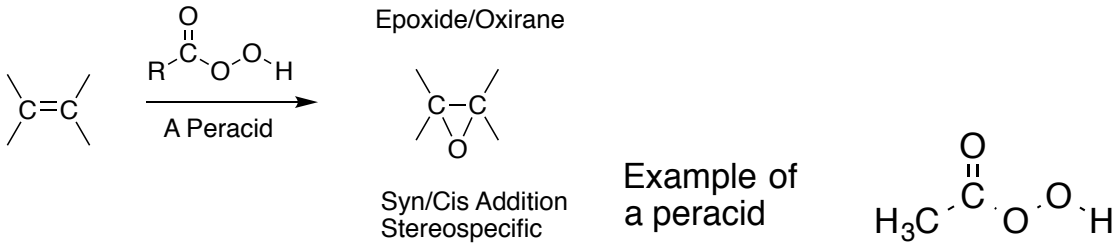
Example: Myrcene – $C_{10}H_{16}$



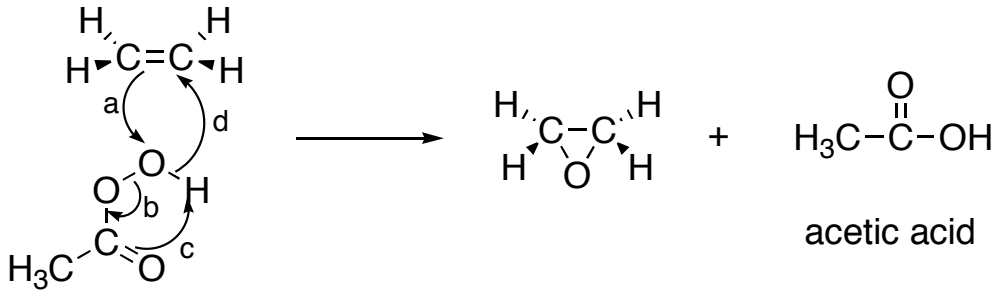
Therefore, structure of Myrcene is:

Oxidation Reactions of Alkenes (Addition Reactions)

Epoxidation:



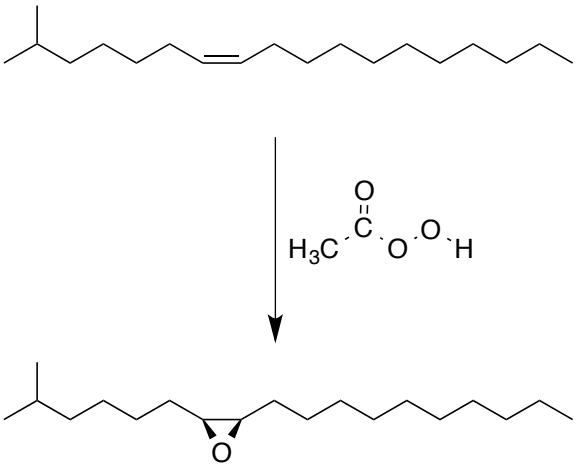
Mechanism:



Concerted process
Stereospecific

Concerted process = all bond breaking and bond making occurs at the same time

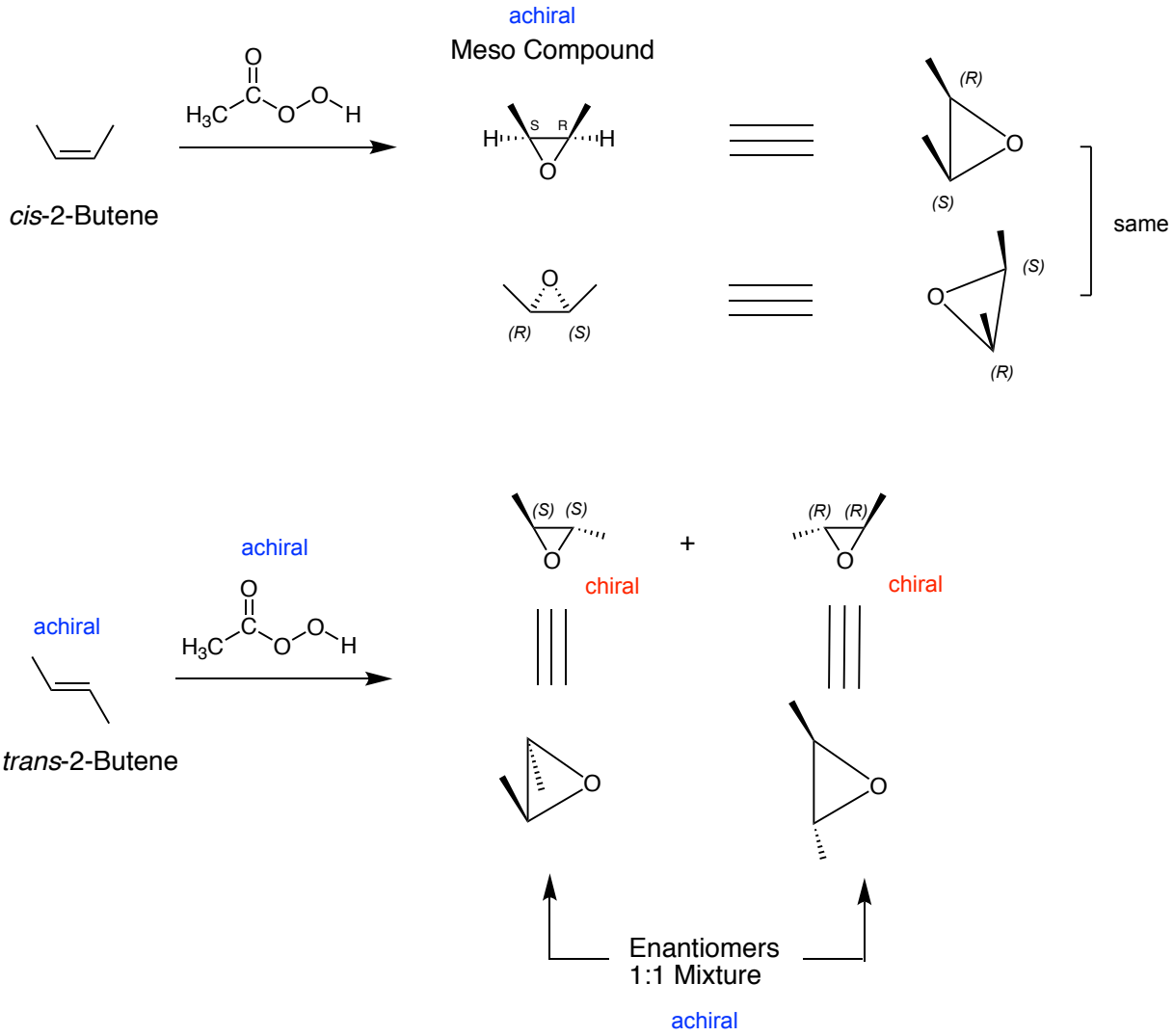
Example 2: 2-Methyl-7-octadecene



Sex pheromone for Gypsy Moth

biologically, only one enantiomer is active (one shown) – racemate produced by peracetic acid

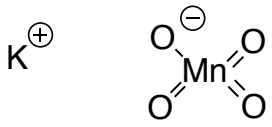
Example: *trans*- vs *cis*-Butene



The possibility of epoxidation from the top is 50% and from the bottom is 50% so a 1:1 mixture of enantiomers is form (racemic mixture).

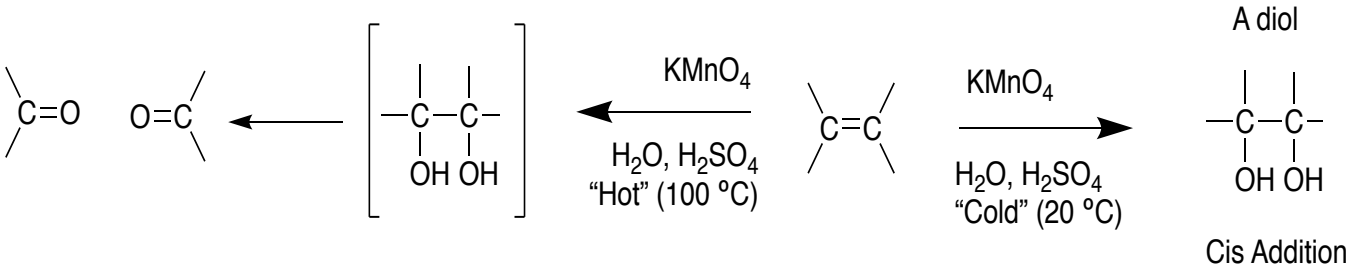
Oxidation Reactions of Alkenes (Addition Reactions)

Potassium Permanganate: $KMnO_4$



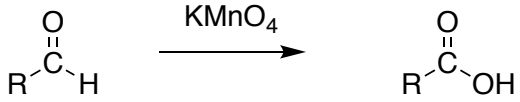
Purple crystals in H_2O and H_2SO_4

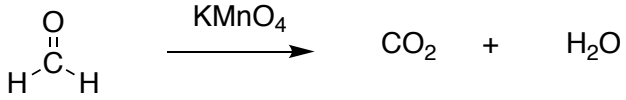
General Scheme:



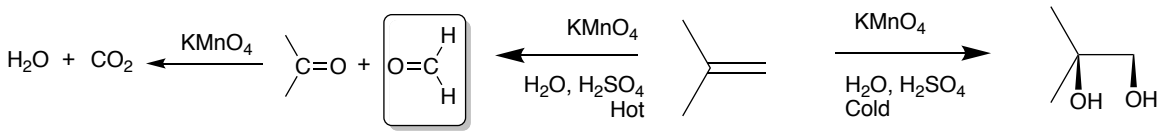
Cis Addition

Reaction with aldehydes:

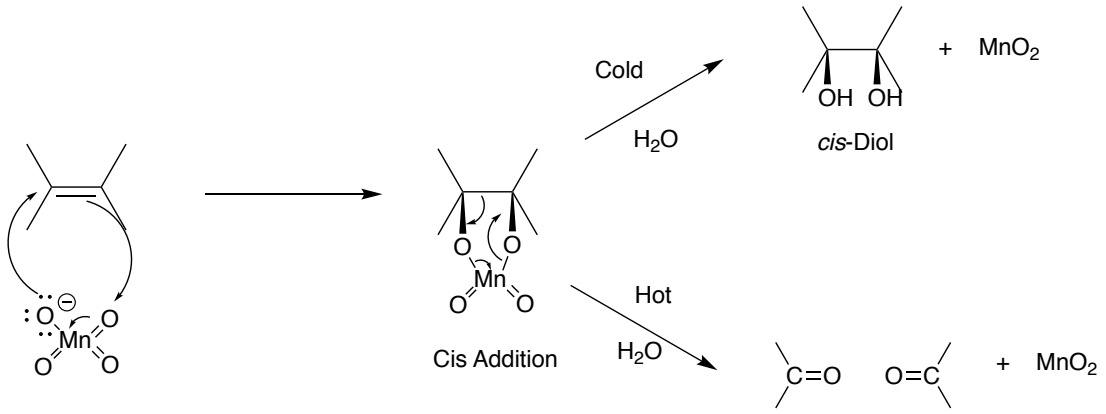




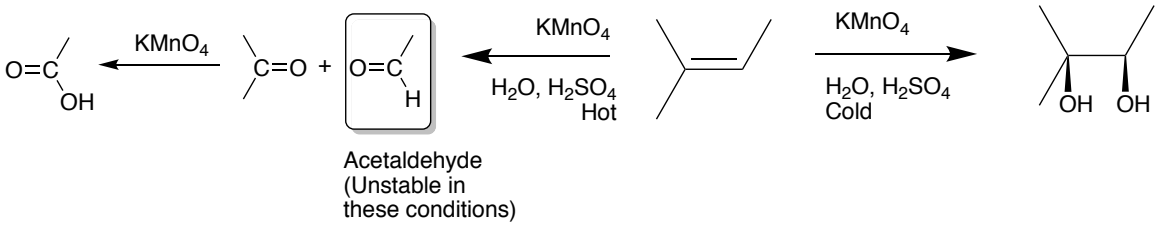
Example 2: Formaldehyde in box is unstable if formed under these conditions (hot $KMnO_4$). The other product is acetone.



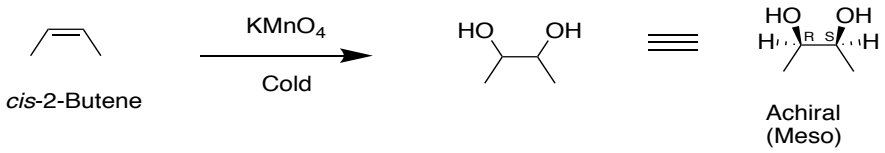
Mechanism:

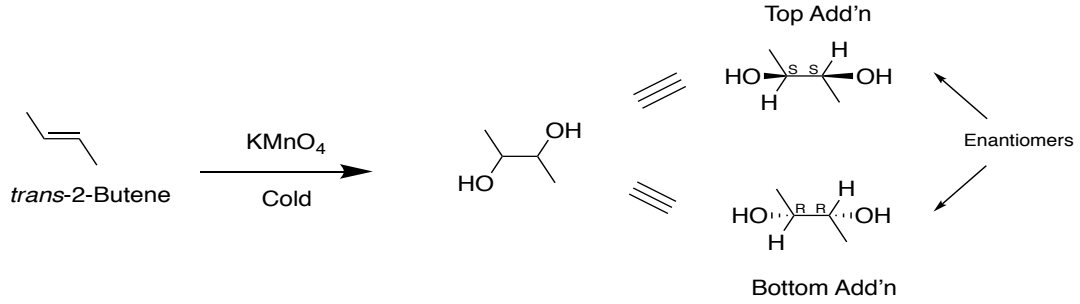


Example 1:

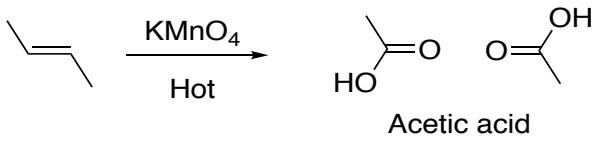


Example 2:

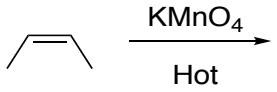




Example 3:



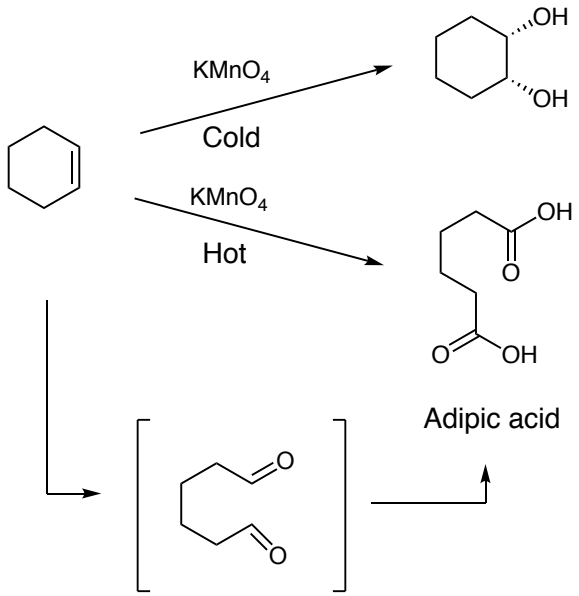
Acetic acid



Same as above

Example 4:

Meso Compound



Adipic acid